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ABSTRACT:

PROBLEM TO BE SOLVED: To obtain a composition which can give a coating film excellent in durability, weathering resistance, especially ultraviolet resistance by including an organopolysilsesquioxane in which at least a specified percentage of the total side chain functional groups are hydroxyl groups or epoxy groups and a crosslinking agent.

SOLUTION: This composition comprises an organopolysilsesquioxane in which 50 mol.% or above, desirably 80-100 mol.% of the total side chain functional groups are hydroxyl groups or epoxy groups and which has a number-average molecular weight of 500-10,000, more desirably 1,000-5,000 (e.g. one having hydroxyl groups as side chain and obtained by reacting total-side chain mercapto-containing organopolysilsesquioxane obtained by hydrolytically condensing γ -mercaptopropylmethoxysilane and reacting the condensate with hexamethyldisiloxane with hydroxyethyl methacrylate) and a crosslinking agent which forms a crosslinkage by reaction with the functional groups (e.g. hexamethylene diisocyanate).

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CLAIMS

[Claim(s)]

[Claim 1] The paint compound characterized by containing the cross linking agent (B) in which more than 50mol% of all side-chain functional groups reacts to with the functional group of the ORGANO PORISHIRU sesquioxane (alpha) which is a hydroxyl group or an epoxy group, and the aforementioned (alpha) component, and it can form the structure of cross linkage.

[Claim 2] The paint compound characterized by the bird clapper at least from the cross linking agent (B) which reacts with the functional group of the acrylic copolymer (C) which has the ORGANO PORISHIRU sesquioxane (alpha) more than whose 50mol% of all side-chain functional groups is a hydroxyl group or an epoxy group, and the functional group which can react with a cross linking agent (B), the above (alpha), and (C), and can form the structure of cross linkage.

[Claim 3] The paint compound according to claim 2 characterized by an acrylic copolymer (C) being a copolymer of the ORGANO PORISHIRU sesquioxane and the vinyl monomer which have an unsaturation double bond in a side chain.

[Claim 4] A paint compound given in one term of claim 1 **** 3 containing a pigment.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to a paint. In more detail, it excels in endurance, weatherability, especially ultraviolet-rays resistance, and is related with a useful paint compound in the field as which these paint film physical properties are required.

[0002]

[Description of the Prior Art] Although global environment problems are taken up from various angles recently, the damage of the ultraviolet rays by ozone layer depletion is one of them with the problem. The damage of ultraviolet rays attains to not only organisms including a human body but the field of outdoor construction and the paint for engineering works, and the appearance of the paint which was excellent in ultraviolet-rays resistance is searched for strongly.

[0003] Although silicon compounds, such as organopolysiloxane and ORGANO PORISHIRU sesquioxane, are excellent in thermal resistance, weatherability, etc. since they have a high Si-O combination of binding energy in the structure, since it is inferior to a mechanical strength, in a the very thing independent, the device of carrying out usage with which the mechanical strength was compensated by denaturation with an epoxy resin or acrylic resin is made and put in practical use.

[0004] There are some which obtain the graft copolymer which has a polysiloxane machine in a side chain by carrying out radical copolymerization of the ORGANO PORISHIRU sesquioxane content monomer, the specific ethylene nature unsaturation monomer, or specific diene monomer containing for example, an unsaturation machine as a method of obtaining such modified resin (JP,60-231720,A). However, its water-repellent ** antifouling property by the graft polysiloxane etc. is inadequate in respect of weatherability, especially ultraviolet-rays resistance, when application to a paint vehicle is considered, although the polysiloxane graft copolymer obtained by this method was expectable.

[0005] Moreover, the manufacture method of the vinyl polymerization object which introduced the siloxane side chain which has two or more functional groups is indicated by carrying out copolymerization of the polysiloxane system macroscopic monomer and vinyl monomer which have two or more functional groups which consist of a hydroxyl group or an alkoxy group to JP,62-275132,A including methyl poly silsesquioxane structure (ladder structure). Although this vinyl copolymer has the feature in the place excellent in cross-linking or compatibility with other resins and there is also a publication of a purport excellent also in properties, such as weatherability, water resistance, and resistance to contamination, the transparency of the paint film obtained from this vinyl copolymer and its surface tension are only described, and there is no concrete description about weatherability, water resistance, and a contamination-resistant improvement and a property.

[0006] On the other hand, the methyl poly silsesquioxane which has a hydroxyl group, an alkoxy group, etc. at the end has the very high reactivity of an end hydroxyl group and an alkoxy group, and it is reported that it is very easy to gel (Nakahama et al., Polymer, Preprints, Japan, 29(1) 73 (1980)), and it has the big fault in respect of the stability on handling, or preservation stability.

[0007] Moreover, as what uses a hydroxyl group for a functional group, the resin compound for paints which is made to carry out surface segregation of the silicone component by the hydroxyl-group content ORGANO siloxane, the hydroxyl-group content organic system resin, the cross linking agent (JP,2-64181,A), or the silicone graft acrylic resin and the cross linking agent (511 12 25 painter study, Vol. No. P 1990) that have a hydroxyl group, and is made to construct a bridge is proposed. However, especially the degree of ultraviolet-rays resistance improvement is low, and these [its] are insufficient, although improvement is accepted about the weatherability evaluated by change of the gloss retention before and behind sunshine Weather-O-meter 2000-hour irradiation.

[0008] Moreover, it is what uses an epoxy group for a functional group. It makes into a key objective to improve the shortage of intensity of the rubber system organic polymer which has a adding-water resolvability silicon machine. The hardenability resin compound (JP,63-156867,A) containing the siloxane which has an epoxy group and the functional group which can react, Although it is transparent, a degree of hardness is large and the coating compound (JP,62-280217,A) containing silicone denaturation epoxy excellent in acid resistance, alkali resistance, thermal resistance, weatherability, etc. is proposed The weatherproof evaluation by change of the gloss retention before and behind the 400-hour irradiation using the DEYU cycle weatherometer which evaluates the former ultraviolet-rays resistance is 58 - 75%, and is extremely inferior in the gloss retention in the 1000-hour examination made into the purpose of this invention as compared with the level of 90% or more.

[0009]

[Problem(s) to be Solved by the Invention] Therefore, this invention aims at offering the paint compound excellent in weatherability, especially ultraviolet-rays resistance which consists of a cross linking agent which can form the structure of cross linkage using the reaction of the ORGANO PORISHIRU sesquioxane and the functional group which have a specific functional group. Especially this invention aims at offering the paint compound excellent in weatherability, especially ultraviolet-rays resistance which consists of a cross linking agent which can form the structure of cross linkage using the reaction of the ORGANO PORISHIRU sesquioxane which has a specific functional group, an acrylic copolymer, and a functional group.

[0010]

[Means for Solving the Problem] As a result of examining wholeheartedly the cross linking agent which reacts with the functional group of ORGANO PORISHIRU sesquioxane, and the aforementioned functional group and can form the structure of cross linkage to obtain the paint compound excellent in weatherability, especially ultraviolet-rays resistance, this invention persons find out that the aforementioned purpose can be attained with the combination of the ORGANO PORISHIRU sesquioxane of specific structure, and a cross linking agent, and came to complete this invention.

[0011] That is, this invention offers the following paint compounds.

- 1) The paint compound characterized by containing the cross linking agent (B) in which more than 50mol% of all side-chain functional groups reacts to with the functional group of the ORGANO PORISHIRU sesquioxane (alpha) which is a hydroxyl group or an epoxy group, and the aforementioned (alpha) component, and it can form the structure of cross linkage.
- 2) The paint compound characterized by the bird clapper at least from the cross linking agent (B) which reacts with the functional group of the acrylic copolymer (C) which has the ORGANO PORISHIRU sesquioxane (alpha) more than whose 50mol% of all side-chain functional groups is a hydroxyl group or an epoxy group, and the functional group which can react with a cross linking agent (B), the above (alpha), and (C), and can form the structure of cross linkage.
- 3) A paint compound given in the 2nd aforementioned term characterized by an acrylic copolymer (C) being a copolymer of the ORGANO PORISHIRU sesquioxane and the vinyl monomer which have an unsaturation double bond in a side chain.
- 4) A paint compound given in either of aforementioned 1 **** 3 containing a pigment.

[0012]

[Embodiments of the Invention] Hereafter, this invention is explained in detail. The component (alpha) used by the paint compound of this invention is ORGANO PORISHIRU sesquioxane which has the structure where more than 50mol% of all the functional groups that exist as a side chain is chosen from a hydroxyl group or an epoxy group. The hydroxyl-group content ORGANO PORISHIRU sesquioxane of the component (alpha) used here understands the alkoxysilane which has a sulfhydryl group an added water part, makes it condense, after it compounds and carries out the end cap (end silanizing) of all the side-chain sulfhydryl-group content ORGANO PORISHIRU sesquioxane, under radical initiator existence, with meanses, such as the Michael addition reaction, can carry out the polymerization of the hydroxyl-group content ethylene nature unsaturated compound, and can manufacture it.

[0013] Here, as alkoxysilane which has a sulfhydryl group used as the synthetic powder of the side-chain hydroxyl-group content ORGANO PORISHIRU sesquioxane used in case the above-mentioned (A) component is manufactured, beta-mercapto ethyl trimethoxysilane, gamma-mercapto propyltrimethoxysilane, delta-mercapto butyltrimethoxysilane, beta-mercapto ethyltriethoxysilane, gamma-mercapto propyl triethoxysilane, delta-mercapto epoxybutyltriethoxysilane, etc. can be raised.

[0014] All the aforementioned side-chain sulfhydryl-group content ORGANO PORISHIRU sesquioxane is understood an added water part under 0.005 to 0.05 time existence of the acid catalyst of a mol to the water and one mol of sulfhydryl-group content trialkoxysilane of a mol to the total number of mols of the sulfhydryl-group content trialkoxysilane which is a raw material 1.0 to 8.0 times, after making it condense, neutralizes the acid which lives together and can manufacture it by removing the salt produced in that case.

[0015] If hydrolysis does not fully advance [the amount of the water used on the occasion of hydrolysis and condensation] under by the 1.0 time mol but the amount of the water used exceeds a mol 8.0 times on the other hand, a condensation reaction will occur quickly and will become easy to produce gelling. Moreover, a condensation reaction occurs quickly all the side-chain sulfhydryl-group content ORGANO PORISHIRU sesquioxane of high ladder structure of the regularity which an irregular three-dimensions-condensation reaction will occur and will be made into the purpose of this invention if a hydrolysis condensation reaction does not fully advance but the amount of the acid catalyst used exceeds a mol 0.05 times is not only obtained under by the 0.005 time mol, but, and the amount of the acid catalyst used on the occasion of hydrolysis and condensation becomes easy to produce gelling.

[0016] The reaction condition for obtaining all side-chain sulfhydryl-group content ORGANO PORISHIRU sesquioxane is 0-100 degrees C and reaction time of reaction temperature] 1 - 24 hours. In order to react efficiently and to raise the regularity of ladder structure, it is desirable to carry out the temperature up of the 50-100 degrees C of the first adding-water decomposition reactions to the temperature of 60-75 degrees C preferably, and to make them react succeedingly for 1 to 10 hours, after [0-20 degrees C] carrying out at low temperature comparatively for 0.5 to 1.0 hours. A halt of a condensation reaction is performed by neutralizing a reaction solution, and filtration or rinsing removes the salt produced in that case.

[0017] End cap(end silyl)-ization of all side-chain sulfhydryl-group content ORGANO PORISHIRU sesquioxane can be performed by making a sililation reagent react to all side-chain sulfhydryl-group content poly silsesquioxane solutions. The thing which cannot be easily influenced of the superfluous water which hydrolysis took as a sililation reagent excluding the halo silane, or itself is understood an added water part under acid atmosphere, and may become a sililation reagent.

[0018] as such a sililation reagent -- a trimethyl silanol -- passing -- KISAME chill disiloxane, a crawl methyl dimethylethoxy

silane, an acetyl triphenyl silane, an ethoxy triphenyl silane, triphenyl silanol, a triethyl silanol, a TORIPURO pill silanol, and a tributyl silanol -- it passes and KISAE chill disiloxane, a trimethyl methoxy silane, a trimethyl ethoxy silane, a triethyl methoxy silane, a triethyl ethoxy run, etc. are mentioned. Although the reaction condition of end-cap(end-silyl)-izing may change also according to the ratio of end-cap(end-silyl)-izing, or the kind of solvent, usually, reaction temperature is 50-100 degrees C, and the range of reaction time is 1 - 8 hours.

[0019] End-cap(end-silyl)-izing of all side-chain sulfhydryl-group content ORGANO PORISHIRU sesquioxane makes a principal chain end hydroxyl group and/or an alkoxy group react with a silylation reagent, and replaces at least 75% or more by the end cap machine. Since it is easy to produce gelling, the stability at the time of storage of the obtained hydroxyl-group content ORGANO PORISHIRU sesquioxane becomes bad and it becomes easy to produce viscosity elevation and gelling in case all side-chain sulfhydryl-group content ORGANO PORISHIRU sesquioxane and a hydroxyl-group content ethylene nature unsaturated compound are made to react, when the substitution to a principal chain end end cap machine is less than 75%, it is not desirable.

[0020] The side-chain hydroxyl-group content ORGANO PORISHIRU sesquioxane which is the (A) component of the paint compound of this invention is compoundable by making all the side-chain sulfhydryl-group content ORGANO PORISHIRU sesquioxane obtained in this way react by meanses, such as the Michael addition reaction, a hydroxyl-group content ethylene nature unsaturated compound and under radical initiator existence. As a hydroxyl-group content ethylene nature unsaturated compound, 2-hydroxyethyl acrylate, 2-hydroxyethyl methacrylate, 2-hydroxypropyl acrylate, 2-hydroxypropyl methacrylate, 2-hydroxy butyl acrylate, 2-hydroxy butyl methacrylate, etc. can be mentioned, for example, and even if these are independent, you may use them with two or more sorts of compounds.

[0021] As a radical initiator, a benzoyl peroxide, methyl ethyl ketone peroxide, azobis isobutyl nitril, cumene hydroperoxide, t-butyl hydronalium peroxide, etc. can be mentioned. As a reaction condition in this case, although reaction temperature is 50-100 degrees C and reaction time is 1 - 8 hours, these reaction conditions may change according to the kind of hydroxyl-group content ethylene nature unsaturated compound to be used, the kind of solvent, the kind of radical initiator, etc.

[0022] The manufacture method of the epoxy-group content ORGANO PORISHIRU sesquioxane which is the component (alpha) of the paint compound of this invention can use the same method as the manufacture method of hydroxyl-group content ORGANO PORISHIRU sesquioxane, i.e., the ethylene nature unsaturated compound which contains an epoxy group instead of a hydroxyl group, and can obtain it using meanses, such as the Michael addition reaction, similarly. As an epoxy-group content ethylene nature unsaturated compound, glycidyl methacrylate, glycidyl acrylate, 3, 4-epoxycyclohexyl methacrylate, 3, and 4-epoxycyclohexyl acrylate etc. is mentioned.

[0023] Although the ORGANO PORISHIRU sesquioxane which contains a desired hydroxyl group or a desired epoxy group in the side chain of ORGANO PORISHIRU sesquioxane is compoundable in this way, if the amount of a hydroxyl group or an epoxy group has the need, it is controllable by the following methods, for example. One of the method of the is a method using a hydroxyl-group (or epoxy group) content ethylene nature unsaturated compound (a) and the ethylene nature unsaturated compound which does not contain a hydroxyl group (or epoxy group) (b), for example, (meta), the proper quantity mixture of the alkyl ester of an acrylic acid, as an ethylene nature unsaturated compound which carries out the Michael addition reaction to all side-chain sulfhydryl-group content ORGANO PORISHIRU sesquioxane. If the Michael addition-reaction nature of a compound (a) and a compound (b) is almost equal, (a) at the time of carrying out the Michael addition reaction and the mixing ratio (mole ratio) of (b) can be mostly equivalent to the amount of side-chain functional groups of the ORGANO PORISHIRU sesquioxane obtained (mole ratio), and can obtain the ORGANO PORISHIRU sesquioxane containing the amount of functional groups of the amount of requests.

[0024] As other methods, as ORGANO PORISHIRU sesquioxane used for the Michael addition reaction for example, in the case where ORGANO PORISHIRU sesqui70-mol the oxane of % of a hydroxyl group (or epoxy group) of a side chain is obtained A side chain is ORGANO PORISHIRU sesquioxane (the remaining 30-mol % of side chain) of % of 70-mol sulfhydryl-group content. After compounding the basis which does not contain sulfhydryl groups, such as a methyl, and carrying out an end cap similarly, for example, by carrying out the Michael addition reaction of the hydroxyl-group (or epoxy group) content ethylene nature unsaturated compound under radical initiator existence The ORGANO PORISHIRU sesquioxane containing the hydroxyl group (or epoxy group) of the amount of requests is compoundable.

[0025] the functional group chosen from the hydroxyl group or epoxy group of a component (ORGANO PORISHIRU sesquioxane) in this invention (alpha) -- all side-chain functional groups -- receiving -- more than 50mol% -- it is 80-100-mol% preferably. It becomes difficult for a functional group to obtain the paint compound excellent in the high weatherability made into the purpose by crosslinking density becoming low less than [50mol%], especially ultraviolet-rays resistance.

[0026] the number average molecular weight (mun) of the ORGANO PORISHIRU sesquioxane of the component in this invention (alpha) -- 500-10000 -- it is 1000-5000 preferably. Weatherability, especially ultraviolet-rays resistance fall [Mn] less than by 500. If Mn exceeds 10000, compatibility with the acrylic copolymer (component C) which has the cross linking agent (component B) which reacts with the functional group of the (A) component and can form the structure of cross linkage, and Component B and the functional group which can react will fall, and it becomes difficult to obtain a uniform compound.

[0027] In the case of combination with (i) hydroxyl-group content ORGANO PORISHIRU sesquioxane, as a cross linking agent which reacts with the aforementioned functional group of a component (alpha) which is the (B) component used by this invention, and forms the structure of cross linkage, the poly isocyanate compound, melamine resin, a multiple-valued carboxylic-acid compound, etc. can be mentioned.

[0028] As a poly isocyanate compound, the poly isocyanates which blocked these dimers or a trimer, and these by phenols, alcohols, oximes, and lactams, such as the tolylene diisocyanate, diphenylmethane -4, 4'-diisocyanate, naphthylene-1-5-diisocyanate, 3, 3'-dimethyl -4, 4'-biphenylene di-isocyanate, xylylene diisocyanate, cyclo hexylmethane diisocyanate, isophorone diisocyanate, and hexamethylene di-isocyanate, are mentioned.

[0029] As melamine resin, the alkoxy melamine resin whose alkoxy groups, such as n-butylated melamine resin and isobutyl-ized melamine resin, are a methoxy machine, an ethoxy basis, an n-butoxy machine, an i-butoxy machine, etc., for example is mentioned. Usually, these resins etherify partially at least an addition reaction or the thing which was made to carry out an addition condensation reaction and was obtained by the monohydric alcohol of carbon numbers 1-4, and a melamine obtains aldehydes, such as formaldehyde and a paraformaldehyde.

[0030] As a multiple-valued carboxylic-acid compound, a maleic acid, a fumaric acid, a citraconic acid, a glutaconic acid, an itaconic acid, etc. are mentioned.

[0031] Moreover, although especially a cross linking agent is not limited in the case of combination with (ii) epoxy-group content ORGANO PORISHIRU sesquioxane (alpha), amines, such as acid anhydrides, such as phthalic anhydride and a succinic anhydride, a meta-phenylenediamine, a diamino diphenyl sulfone, and ethylenediamine, a phenol novolak resin, a cresol novolak resin, etc. are mentioned, for example. Moreover, combined use of a hardening accelerator can also be performed if needed. As a hardening accelerator, phosphines, such as imidazole derivatives, such as tertiary amines, such as 2-(dimethyl aminomethyl) phenol, 2 and 4, 6-tris (dimethyl aminomethyl) phenol, and a ** NJIRU dimethylamine, 2-methyl imidazole, and 2-phenyl imidazole, and triphenyl phosphine, can be illustrated, for example.

[0032] the paint compound of this invention -- the compound of the above (alpha) and (B) -- in addition, it is desirable to contain the acrylic copolymer (component (C)) which has a cross linking agent (B) and the functional group which can react. Although it is not necessary to necessarily (alpha) use what has the same functional group as the functional group of a component as an acrylic copolymer (C), what has the same functional group is convenient.

[0033] Although there will be especially no limit if the vinyl monomer which is used in this invention and which constitutes the acrylic copolymer of the (C) component is used for a paint, as the constituent, a glass transition temperature (Tg) is low, the monomer component and glass transition temperature which form a soft resin are high, and a functional-group content monomer component is mentioned to the comonomer component and pan which constitute a stiff resin.

[0034] As such a monomer component, an ethyl acrylate, a butyl acrylate, Isobutyl acrylate, acrylic-acid 2-ethylhexyl, acrylic-acid lauryl, About two to 12 carbon number [of alkyl groups, such as an acrylic-acid n-dodecyl and acrylic-acid cyclohexyl,] acrylic-acid alkyl ester, Methacrylic-acid butyl, a methacrylic-acid isobutyl, methacrylic-acid 2-ethylhexyl, About four to 12 carbon number [of alkyl groups, such as a methacrylic-acid lauryl and methacrylic-acid n-dodecyl,] alkyl methacrylate ester etc. is mentioned. as the aforementioned comonomer component The acrylic-acid (meta) alkyl ester of the carbon numbers 1-3 of alkyl groups, such as a methyl acrylate, a methyl methacrylate, an ethyl methacrylate, and a methacrylic-acid propyl Cyclohexyl methacrylate, vinyl acetate, acrylonitrile, a methacrylonitrile, styrene, etc. are mentioned.

[0035] As the aforementioned functional-group content monomer component, an acrylic acid, a methacrylic acid, Monocarboxylic acids, such as a crotonic acid, a maleic acid, a fumaric acid, a citraconic acid, Carboxyl group content monomers and 2-hydroxyethyl (meta) acrylate, such as multiple-valued carboxylic acids, such as a glutaconic acid and an itaconic acid, and these anhydrides, 2-hydroxypropyl (meta) acrylate, 3-chloro-2-hydroxypropyl (meta) acrylate, Diethylene-glycol monochrome (meta) acrylate, hydroxyethyl vinyl ether, Besides hydroxyl content monomers, such as hydroxypropyl vinyl ether, a hydroxy butyl vinyl ether, etc. and N-methylol acrylamide, etc., an acrylamide (meta), Dimethylaminoethyl methacrylate, glycidyl methacrylate, acrylic glycidyl ether, etc. are mentioned. Also in this functional-group content monomer component, especially use of a hydroxyl and a carboxyl group content monomer is desirable.

[0036] The acrylic copolymer used of the (C) component of this invention is the method of the common knowledge indicated by for example, the paint technical handbook (the volume on Japanese paint technical association, the February, Showa 62 issue, Nikkan Kogyo Shimbun Ltd., 154 pages), and can be easily manufactured by carrying out radical copolymerization of the aforementioned monomer, a comonomer, and the functional-group content monomer in the organic solvent. Generally the amount of the functional-group content monomer which has active hydrogen, such as these hydroxyl groups, epoxy groups, etc. A copolymer includes in a standard 20-150, and the amount that serves as 30 - 120kappaOetam/g preferably as hydroxyl-group (OH) ** generally used in paints. As other vinyl monomers, out of acrylic-acid 2-ethylhexyl of a low Tg component, such as a methyl methacrylate of a high Tg component, and cyclohexyl methacrylate, a butyl acrylate, etc., usually it combines and uses so that it may have desired taug.

[0037] Moreover, combination which becomes a part of principal chain of the skeletal structure of the acrylic copolymer of the (C) component in this invention and/or side chain from ORGANO PORISHIRU sesquioxane can also be introduced. This introduction is performed by copolymerizing with other vinyl monomers which constitute the acrylic copolymer of the (C) component using what has polymerization nature unsaturation machines and functional groups, such as a vinyl group, in a part of principal chain of ORGANO PORISHIRU sesquioxane, or side chain.

[0038] The rate of the component (alpha) in the paint compound of this invention, and the (B) component and the (C) component is prescribed by the combination of the amount of cross linking agents to each amount of functional groups. namely, -- the case of the combination of the (i) hydroxyl group and the poly isocyanate -- omicroneta ** of the (C) component -- 20-150 -- it is 30 - 120kappaOetam/g preferably (alpha) the rate of a component and the (C) component -- weight criteria -- : (alpha) (C) = -- it is 2 - 20% : 98 - 80% preferably 1 - 100% : 99 to 0% (alpha) When the rate of a component is less than 1%, sufficient ultraviolet-rays

resistance is not demonstrated. (alpha) 0.3-2.0Eq 0.5-1.5Eq is more preferably suitable for the amount of the (B) component (poly isocyanate) to a component and the (C) component to OH ** of (alpha)+(C) component. If it is not practical and 2.0Eq is exceeded since sufficient hardening paint film is not obtained when the amount of the poly isocyanate is less than 0.3Eq, the flexibility of a paint film will be lost and it will become inadequate [adhesion with a base material].

[0039] (ii) -- the case of the combination of an epoxy group and an acid anhydride -- the weight per epoxy equivalent of the (C) component -- 250-3000 -- desirable -- 300-2000 -- it is -- the rate of a component (alpha) and the (C) component -- : (alpha) (C) = -- 2 - 20 % of the weight : 98 - 80 % of the weight is preferably suitable 1 - 100 % of the weight : 99 to 0% of the weight (alpha) When there are few components than the above-mentioned amount, sufficient ultraviolet-rays resistance is not demonstrated. Moreover, 0.3-2.0Eq 0.5-1.5Eq is more preferably suitable for the amount of the (B) component (acid anhydride) to (alpha)+(C) component to the weight per epoxy equivalent of (alpha)+(C). If it is not practical and 2.0Eq is exceeded since sufficient hardening paint film is not obtained when the amount of an acid anhydride is less than 0.3Eq, the flexibility of a paint film will be lost, and there is an inclination for adhesion with a base material and water resistance to be inferior.

[0040] (iii) the case of the combination of a hydroxyl group and melamine resin -- Oeta ** of the (C) component -- 20-150 -- it is 30 - 120kappaOetamg/g preferably (alpha) the rate of a component and the (C) component -- : (alpha) (C) = -- 2 - 20 % of the weight : 98 - 80 % of the weight is preferably suitable 1 - 100 % of the weight : 99 to 0% of the weight (alpha) When there are few components than the above, sufficient ultraviolet-rays resistance is not demonstrated. moreover, the operating rate of the (B) component (melamine resin) to (alpha)+(C) component -- (alpha)+(C):melamine resin =40-95 weight section:60 - 5 weight section -- it is 50-90 weight section:50 - 10 weight section preferably Since hardening paint film with melamine resin sufficient in under 5 weight sections is not obtained, it is not practical, and it becomes [a paint film becomes firmly and weak and] inadequate [adhesion with a base material] and is not desirable when exceeding 60 weight sections on the other hand.

[0041] In the paint compound of this invention, the pigment other than the above-mentioned resinous principle can be contained. As a pigment component, a well-known color pigment, an extender, a photoluminescent pigment, etc. can be mentioned. As a color pigment, a titanium dioxide, the white lead, a graphite, zinc sulfide, a zinc oxide, a chrome oxide, a zinc chromate, a strontium chromate, a barium chromate, yellow nickel titanium, yellow chromium titanium, graphite, carbon black, an iron oxide, a Synthetic Ochre, a red iron oxide, a black iron oxide, a copper phthalocyanine blue, a Phthalocyanine Green, ultra marine blue, Quinacridones, indan SURON, iso indoline, a perylene, an ANSURA pyridine, ** NZUIMIDAJIN, a cadmium sulfide, a SHIKETO pyrrolo pyrrole, etc. can be mentioned, for example.

[0042] As an extender used for the purpose, such as reinforcement of a paint film, inorganic substances, such as a calcium-carbonate system, a magnesium-carbonate system, a barium-sulfate system, a silicic-acid system, a silicate system, an aluminum hydrate system, and a calcium-sulfate system, can be mentioned, for example. The metallic foil-like pigment chosen from a mica pigment, an aluminum foil, a bronze foil, tinfoil, gold foil, silver leaf, copper foil, a titanium metal foil, a stainless-steel foil, a nickel foil, chromium, a cobalt sulfide, a manganese sulphide, sulfuration titanium and the alloy foil of these metals, the metallic foil covered with the resin, the foil-like copper phthalocyanine blue, etc. as a photoluminescent pigment, for example can be mentioned. These pigments are independent, or can mix and use two or more sorts.

[0043] A thickener, an ultraviolet ray absorbent, an antioxidant, a defoaming agent, a leveling agent, a coupling agent, etc. can use the additive in the paint combination usually commonly used in this industry etc. for the paint compound of this invention if needed. Moreover, in case the paint compound of this invention is used, in order to make paint workability etc. good, the arbitrary organic solvents usually used in the paint or these partially aromatic solvents can be used.

[0044] as a solvent, amides, such as ether; N-methyl pyrrolidones, such as aromatic-hydrocarbon; dibutyl ether, such as lactone:toluene, such as ketones; gamma-butyl lactone, such as ester; methyl ethyl ketones, such as alcohols; ethyl acetate, such as methyl alcohol, ethyl alcohol, isopropyl alcohol, butyl alcohol, ethoxy ethanol, ethoxy propanol, and methoxy propanol, methyl acetate, and butyl acetate, and a methyl isobutyl ketone, and a xylene, and ethylene glycol diethylether, are used suitably, for example

[0045] A curing catalyst can be used for the paint compound of this invention. As a curing catalyst, for example Inorganic-acids; acetic acids, such as a hydrochloric acid, a nitric acid, and a phosphoric acid, Organic acids, such as formic acid, a maleic acid, a phthalic acid, a benzoic acid, and Para toluenesulfonic acid; A dibutyltin diacetate, Organic tin compounds, such as a dibutyltin JIOKUCHI rate and dibutyltin dilaurate, Organic zirconiums, such as tetrabutyl zirconate and a butoxy tris (acetylacetonato) zirconium; Ethylenediamine, A diethylenetriamine, a piperazine, a meta-phenylenediamine, a diethanolamine, Amines, such as a triethanolamine; although organoaluminium compounds, such as alkali compound; epoxy compounds, such as a sodium hydroxide and a potassium hydroxide, tris (acetylacetonato) aluminum, and tris (ethyl acetonato) aluminum, etc. are mentioned An inorganic acid, an organic tin compound, an organic acid, and an organoaluminium compound are especially desirable.

[0046] the method by which the paint by the paint compound of this invention is usually used, i.e., spray coat paint, brush coating paint, dip coating, roll coating, sink paint (flow coat), etc. -- it can carry out -- the kind of after paint and cross linking agent -- responding -- ordinary temperature dryness -- or stoving is carried out and a paint film is stiffened Although especially the thickness of the paint film of the paint compound in this invention is not limited, it can be freely chosen in about 0.1-1000 micrometers. Moreover, not only coating but many paint processings can adjust such thickness easily once.

[0047]

[Example] Although an example and the example of comparison are given and this invention is explained still in detail hereafter, this invention is not limited to the following example at all. In addition, each physical-properties value in an example and the example of comparison was measured according to the following method.

[0048] Physical-properties measuring method (1) weatherability (ultraviolet-rays resistance)

Based on the reference test method (reference 2.2 accelerated-test 2.2.1(3) ultraviolet-rays fluorescent light weather meter) of a publication, ultraviolet-rays resistance was evaluated using the DEYUPANERU light control weatherometer (SUGA testing machine) to JIS D0205. UV irradiation of the test condition was carried out at 70 degrees C for 8 hours, it measured the paint film appearance and the gloss value of 1000 hours after by following (2) and the method of (3) in the cycle humid for 4 hours in 50 degrees C, respectively, and asked for gloss retention by the following formula.

[0049]

[Equation 1]

Gloss-retention = $(b/a) \times 100$ after 1000 hour irradiation: The gloss value (initial gloss value) of a non-irradiated paint film, the gloss value of the paint film after b:1000-hour irradiation.

[0050] (2) The paint film formed on the paint film appearance substrate was inspected visually, and the evaluation judging was carried out on the following criteria.

O : -- **: which whose appearance is good and does not almost have change of gloss -- it is almost bad [x:appearance the fall of gloss is clearly accepted to be] lusterless, and generating of cracking, a crack, etc. is looked at by the paint film

[0051] (3) Use a gloss value digital deflection glossmeter VG-ID type (product made from a Japanese **** industry), and it is 60-degree specular gloss JIS kappa5400 It applied correspondingly and measured.

[0052] The synthetic example 1: The synthetic thermometer, the churning equipment, reflux condenser, and nitrogen introduction pipe of side-chain hydroxyl-group content ORGANO PORISHIRU sesquioxane (alpha-1). After teaching gamma-mercapto propyltrimethoxysilane 196g (1000mmol) and 54g (3000mmol) of water to the attached 500ml flask under nitrogen reflux and dropping 10g (10mmol) of 3.6% of hydrochloric-acid solution, the reaction temperature of mixture was kept at 70 degrees C, and the hydrolysis condensation reaction was performed for 3 hours. Next, hexa methyl disiloxane 65g (400mmol) was added, and the silanizing reaction was performed for 3 hours. After cooling the obtained reaction solution to 40 degrees C, a potassium hydroxide solution neutralized and filtration and rinsing removed the salt produced at that time. 10g [of all side-chain sulfhydryl-group content ORGANO PORISHIRU sesquioxane solutions] (8.3mmol) and ethanol 34g end-cap-ized under nitrogen reflux in the 100ml flask which attached a thermometer, churning equipment, the reflux condenser, and the nitrogen introduction pipe was taught, and the reaction temperature of mixture was kept at 70 degrees C. Next, the solution which mixed methacrylic-acid hydroxyethyl 7.4g (56.9mmol), dimethyl 2, and 2-azobis (2-methyl propionate) 0.53g (2.3mmol) and ethanol 6.7g was dropped into the system of reaction, and the Michael addition reaction was performed for 3 hours. The solvent was removed for this solution at 200mmHg(s) and 40 degrees C, and 17g of transparent and colorless more than side-chain hydroxyl-group 99mol% content ORGANO PORISHIRU sesquioxane (A-1) solutions was obtained. Number average molecular weight was 3000 and the hydroxyl group and alkoxy-group (Si-OR) total of the end for which it asked from each peak of 1eta, 13C, and 29 Si-NMR to the end cap machine substitution ratio was 79%. Moreover, the sulfhydryl group reacted quantitatively with the ethylene nature unsaturated compound, and, according to 1 eta-NMR, unreacted sulfhydryl groups were less than 1% of all side chains.

[0053] The synthetic example 2: The synthetic thermometer, the churning equipment, reflux condenser, and nitrogen introduction pipe of side-chain epoxy-group content ORGANO PORISHIRU sesquioxane (alpha-2). After teaching gamma-mercapto propyltrimethoxysilane 196g (1000mmol) and 54g (3000mmol) of water to the attached 500ml flask under nitrogen reflux and dropping 50g (50mmol) of 3.6% of hydrochloric-acid solution, the reaction temperature of mixture was kept at 70 degrees C, and the hydrolysis condensation reaction was performed for 10 hours. Next, it passed, KISAME chill disiloxane 65g (400mmol) was added, and the silanizing reaction was performed for 3 hours. After cooling the obtained reaction solution to 40 degrees C, a potassium hydroxide solution neutralized and filtration and rinsing removed the salt produced at that time. 10g [of all side-chain sulfhydryl-group content ORGANO PORISHIRU sesquioxane solutions] and ethanol 34g which the above end-cap-ized under nitrogen reflux in the 100ml flask which attached a thermometer, churning equipment, the reflux condenser, and the nitrogen introduction pipe was taught, and the reaction temperature of mixture was kept at 70 degrees C. Next, the solution which mixed 8.0g [of glycidyl methacrylates] (56mmol), dimethyl 2, and 2-azobis (2-methyl propionate) 0.5g (2.3mmol) and ethanol 7.9g was dropped into the system of reaction, and the Michael addition reaction was performed for 3 hours. The solvent was removed for this solution at 200mmHg(s) and 40 degrees C, and 17g of transparent and colorless more than side-chain epoxy-group 99mol% content ORGANO PORISHIRU sesquioxane (A-2) solutions was obtained. Number average molecular weight was 3200 and the total of the hydroxyl group of an end for which it asked from each peak of 1eta, 13C, and 29 Si-NMR, and/or an alkoxy group (Si-OR) to the end cap machine substitution ratio was 79%. Moreover, the sulfhydryl group reacted quantitatively with the ethylene nature unsaturated compound, and, according to 1 eta-NMR, unreacted sulfhydryl groups were 1% or less of all side chains.

[0054] The synthetic example 3: The synthetic thermometer, the churning equipment, reflux condenser, and nitrogen introduction pipe of side-chain hydroxyl-group 80mol% content ORGANO PORISHIRU sesquioxane (alpha-3). After teaching gamma-mercapto propyltrimethoxysilane 196.4g (1000mmol) and 54g (3000 mols) of water to the attached 500ml flask under nitrogen reflux and dropping 10g (10mmol) of 3.6% of hydrochloric-acid solution, the reaction temperature of mixture was kept at 70 degrees C, and the hydrolysis condensation reaction was performed for 3 hours. Next, it passed, KISAME chill disiloxane 65g (400mmol) was added, and the silanizing reaction was performed for 3 hours. After cooling the obtained reaction solution to 40 degrees C, filtration and rinsing removed the salt which neutralized with a potassium hydroxide solution and was produced at that time. 10g [of all side-chain sulfhydryl-group content ORGANO PORISHIRU sesquioxane solutions] and ethanol 34g end-cap-ized [above] under nitrogen reflux in the 100ml flask which attached a thermometer, churning equipment, the reflux

condenser, and the nitrogen introduction pipe was taught, and the reaction temperature of mixture was kept at 70 degrees C. Next, the solution which mixed methacrylic-acid hydroxyethyl 6.0g (46mmol), 1.1g [of methyl methacrylates] (11mmol), dimethyl 2, and 2-azobis (2-methyl propionate) 0.53g (2.3mmol) and ethanol 6.7g was dropped into the system of reaction, and the Michael addition reaction was performed for 3 hours. The solvent was removed for this solution at 200mmHg(s) and 40 degrees C, and 17g of transparent and colorless side-chain hydroxyl-group 80mol% content ORGANO PORISHIRU sesquioxane (A-3) solutions was obtained. Number average molecular weight was 3000 and the end cap machine substitution ratio for which it asked from the total of the hydroxyl group of an end for which it asked from each peak of 1eta, 13C, and 29 Si-NMR, and an alkoxy group (Si-OR) was 79%. Moreover, the sulfhydryl group reacted quantitatively with the ethylene nature unsaturated compound, and, according to 1 H-NMR, unreacted sulfhydryl groups were 1% or less of all side chains.

[0055] The synthetic example 4: The synthetic thermometer, the churning equipment, reflux condenser, and nitrogen introduction pipe of side-chain hydroxyl-group 30mol% content ORGANO PORISHIRU sesquioxane (alpha-4). After teaching gamma-mercaptopropyltrimethoxysilane 194.6g (1000mmol) and 54g (3000 mols) of water to the attached 500ml flask under nitrogen reflux and dropping 10g (10mmol) of 3.6% of hydrochloric-acid solution, the reaction temperature of mixture was kept at 70 degrees C, and the hydrolysis condensation reaction was performed for 3 hours. Next, it passed, KISAME chill disiloxane 65g (400mmol) was added, and the silanizing reaction was performed for 3 hours. After cooling the obtained reaction solution to 40 degrees C, filtration and rinsing removed the salt which neutralized with a potassium hydroxide solution and was produced at that time. 10g [of all side-chain sulfhydryl-group content ORGANO PORISHIRU sesquioxane solutions] and ethanol 34g end-cap-ized [above] under nitrogen reflux in the 100ml flask which attached a thermometer, churning equipment, the reflux condenser, and the nitrogen introduction pipe was taught, and the reaction temperature of mixture was kept at 70 degrees C. Next, the solution which mixed methacrylic-acid hydroxyethyl 2.2g (17mmol), 4.0g [of methyl methacrylates] (40mmol), dimethyl 2, and 2-azobis (2-methyl propionate) 0.53g (2.3mmol) and ethanol 6.7g was dropped into the system of reaction, and the Michael addition reaction was performed for 3 hours. The solvent was removed for this solution at 200mmHg(s) and 40 degrees C, and 17g of transparent and colorless side-chain hydroxyl-group 30mol% content ORGANO PORISHIRU sesquioxane (A-4) solutions was obtained. Number average molecular weight was 3000 and the total of the hydroxyl group of an end for which it asked from each peak of 1eta, 13C, and 29 Si-NMR, and an alkoxy group (Si-OR) to the end cap machine substitution ratio was 79%. Moreover, the MERUKAPU ** machine reacted quantitatively with the ethylene nature unsaturated compound, and, according to 1 eta-NMR, unreacted sulfhydryl groups were 1% or less of all side chains.

[0056] The synthetic example 5: The synthetic thermometer, the churning equipment, reflux condenser, and nitrogen introduction pipe of side-chain epoxy-group 30mol% content ORGANO PORISHIRU sesquioxane (alpha-5). After teaching gamma-mercaptopropyltrimethoxysilane 59g (300mmol), methyl triethoxysilane 125g (700mmol), and 54g (3000mmol) of water to the attached 500ml flask under nitrogen reflux and dropping 10g (10mmol) of 3.6% of hydrochloric-acid solution, the reaction temperature of mixture was kept at 70 degrees C, and the hydrolysis condensation reaction was performed for 3 hours. Next, it passed, KISAME chill disiloxane 65g (400mmol) was added, and the silanizing reaction was performed for 3 hours. After cooling the obtained reaction solution to 40 degrees C, filtration and rinsing removed the salt which neutralized with a potassium hydroxide solution and was produced at that time. 10g [of the ORGANO PORISHIRU sesquioxane (A-5) solutions] and ethanol 34g which contains a sulfhydryl group and a methyl group in the side chain end-cap-ized [above] under nitrogen reflux was taught to the 100ml flask which attached a thermometer, churning equipment, the reflux condenser, and the nitrogen introduction pipe, and the reaction temperature of mixture was kept at 70 degrees C. Next, the solution which mixed 2.4g [of glycidyl methacrylates] (17mmol), dimethyl 2, and 2-azobis (2-methyl propionate) 0.5g (2.3mmol) and ethanol 6.7g was dropped into the system of reaction, and the Michael addition reaction was performed for 3 hours. The solvent was removed for this solution at 200mmHg(s) and 40 degrees C, and 17g of transparent and colorless side-chain epoxy-group 30mol% content ORGANO PORISHIRU sesquioxane solutions was obtained. Number average molecular weight was 3000 and the total of the hydroxyl group of an end for which it asked from each peak of 1eta, 13C, and 29 Si-NMR, and an alkoxy group (Si-OR) to the end cap machine substitution ratio was 79%. Moreover, the sulfhydryl group reacted quantitatively with the ethylene nature unsaturated compound, and, according to 1 eta-NMR, unreacted sulfhydryl groups were 1% or less of all side chains.

[0057] The synthetic example 6: It is under nitrogen reflux to the 2000ml flask which attached the synthetic thermometer, the churning equipment, reflux condenser, and nitrogen introduction pipe of an acrylic copolymerization resin (C-1). When the compound which consists of the blending ratio of coal shown in the following table 1 was put in, and it was made to react at 85 degrees C for 5 hours, flowing back, the conversion by GPC became 99% or more, and number average molecular weight is the polymer of 20000, and obtained the acrylic copolymerization resin (C-1) of OH ** =70 KOHmg/g.

[0058]

[Table 1]

** Part . Rate ** A methyl methacrylate 21 weight sections Methacrylic-acid n-butyl 11 weight sections Acrylic-acid 2-ethylhexyl 11 weight sections Methacrylic-acid hydroxyethyl 9 weight section t-butyl dodecane thiol 2 weight sections Azobis isobutyl nitril 1 weight section Ethyl acetate 70 weight sections . [0059] The synthetic example 7: 3-methacryloxy-propyl-trimethoxysilane 9.8g, methyl triethoxysilane 77.4g, phenyl trimethoxysilane 2.42g, and 26.3g of purified waters were taught to 300ml flask which attached the synthetic thermometer, the churning equipment, nitrogen introduction pipe, and reflux cooling pipe of the ORGANO PORISHIRU sesquioxane content acrylic copolymerization resin (C-2), and it agitated at 5 degrees C under the nitrogen air current. After 5g of 10% of hydrochloric-acid solution was dropped at this in 30 minutes, it held at 10 degrees C for 1 hour, the temperature up was carried out to 70 more degrees C, and the reaction of 3 hours was performed. Subsequently, after having

added 19.1g hexa methyl disiloxane, performing churning in this ** further for 3 hours and carrying out capping of a principal chain end, solution temperature was lowered to 40 degrees C, 15.3g of methanol solutions of 5% of potassium hydroxide was added to this, and it put at the room temperature for 12 hours. The lower layer portion divided into the bilayer was extracted, and the reaction solution was filtered, after condensed under reduced pressure of 40 degrees C and 200mmHg, removing the 80g distillate, returning to the ordinary pressure, adding 170g butyl acetate and performing churning of 1 hour, adding and agitating 80g butyl acetate to this. The number average molecular weight of the ORGANO PORISHIRU sesquioxane (following LS- 1) which has an unsaturation double bond in the obtained side chain was 3200. 25.9g LS-1 and 33.7g 2-hydroxyethyl methacrylate, 17.3g methyl methacrylate, 49.1g n-butyl methacrylate, 15.9g 2-ethylhexyl acrylate, the 2.2g methacrylic acid, and the 2.44g dodecyl mercaptan were added to 300ml flask possessing above equipment, it agitated under the nitrogen air current for 30 minutes, and the mixed monomer solution was created. After measuring 26.6g of mixed monomer solutions, and 55.0g of butyl acetate in the same 300ml flask as the above and agitating it under a nitrogen air current for 30 minutes, 12.4g of butyl-acetate solutions of 7.9% of the weight of a 2 and 2'-azobisiso butanoic acid dimethyl was added, and the reaction was performed for 30 minutes at 80 degrees C. Subsequently, 6.4g of butyl-acetate solutions of after dropping and 7.9% of the weight of a 2 and 2'-azobisiso butanoic acid dimethyl was added for 106g of mixed monomer solutions over 3 hours, the reaction for 2 hours and 30 minutes was performed at 90 degrees C, and 194g (C-2) of the ORGANO PORISHIRU sesquioxane content acrylic copolymerization resins of number average molecular weight 13000 was obtained.

[0060] On the example 1 glass substrate, it mixed uniformly and the component of prescription shown in the following table 2 was paint-ized, it painted so that the thickness after dryness might be set to 20 micrometers, and physical-properties evaluation of the ultraviolet-rays resistance after dryness etc. was performed for seven days in ordinary temperature.

[0061]

[Table 2]

** Part . Rate ** alpha-1 3 weight sections C-1 41 weight sections Hexamethylene di-isocyanate system poly ISOSHIANE ** (made in [Sumitomo Beyer urethane] Sumi Joule N-3500) 7 weight section TIPAQUE CR 97 (a titanium oxide pigment, Ishihara Sangyo make) 19 weight sections Butyl acetate 30 weight sections . [0062] By the same method as example 2 example 1, it mixed uniformly and the component of prescription shown in the following table 3 was paint-ized, it painted so that the thickness after dryness might become 20 micrometers on an above-mentioned base-material front face, and physical-properties evaluation of ultraviolet-rays resistance etc. was performed after 180-degree-C 30-minute printing.

[0063]

[Table 3]

** Part . Rate ** A-2 5 weight sections C-1 39 weight sections Curing agent phenol novolak resin (Nippon Kayaku Co., Ltd. make) 7 weight section TIPAQUE CR 97 19 weight sections Butyl acetate 30 weight sections . [0064] By the same method as example 3 example 1, it mixed uniformly and the component of prescription shown in the following table 4 was paint-ized, it painted so that the thickness after dryness might become 20 micrometers on an above-mentioned base-material front face, and physical-properties evaluation of ultraviolet-rays resistance etc. was performed after the dryness between seven days of ordinary temperature.

[0065]

[Table 4]

** Part . Rate ** alpha-3 3 weight sections C-1 41 weight sections SUMIJURU N-3500 7 weight sections TIPAQUE CR 97 19 weight sections Butyl acetate 30 weight sections [0066] By the same method as example 4 example 1, it mixed uniformly and the component of prescription shown in the following table 5 was paint-ized, it painted so that the thickness after dryness might become 20 micrometers on an above-mentioned base-material front face, and physical-properties evaluation of ultraviolet-rays resistance etc. was performed after 180-degree-C 30-minute printing.

[0067]

[Table 5]

** Part . Rate ** alpha-1 4 weight sections C-1 30 weight sections You van 2061 (butyl-ized melamine Mitsui Toatsu Chemicals make) 17 weight section TIPAQUE CR 97 19 weight sections Butyl acetate 30 weight sections . [0068] By the same method as example 5 example 1, it mixed uniformly and the component of prescription shown in the following table 6 was paint-ized, it painted so that the thickness after dryness might become 20 micrometers on an above-mentioned base-material front face, and physical-properties evaluation of ultraviolet-rays resistance etc. was performed after the dryness between seven days of ordinary temperature.

[0069]

[Table 6]

** Part . Rate ** alpha-1 3 weight sections alpha 801 (acrylic resin, Dainippon Ink & Chemicals make) 41 weight sections Sumi Joule N-3500 7 weight sections TIPAQUE CR 97 19 weight sections butyl acetate 30 weight sections . [0070] It was alike like example 6 example 1, and the component of prescription shown in the following table 7 was paint[mixed]-ized uniformly, it painted so that the thickness after dryness might become 20 micrometers on an above-mentioned base-material front face, and physical-properties evaluation of ultraviolet-rays resistance etc. was performed after the dryness between seven days of ordinary temperature.

[0071]

[Table 7]

**** Part . Rate **** alpha-1 3 weight sections C-1 41 weight sections Sumi Joule N-3500 7 weight sections Butyl acetate 49 weight sections . [0072] By the same method as example 7 example 1, the component of prescription shown in the following table 8 was paint[mixed]-ized uniformly, it painted so that the thickness after dryness might become 20 micrometers on an above-mentioned base-material front face, and physical-properties evaluation of ultraviolet-rays resistance etc. was performed after the dryness between seven days of ordinary temperature.

[0073]

[Table 8]

**** Part . Rate **** alpha-1 40 weight sections Sumi Joule N-3500 10 weight sections TIPAQUE CR 97 20 weight sections Butyl acetate 30 weight sections . [0074] By the same method as example 8 example 1, the component of prescription shown in the following table 9 was paint[mixed]-ized uniformly, it painted so that dry film thickness might be set to 25 micrometers to an aluminum substrate, and physical-properties evaluation of ultraviolet-rays resistance etc. was performed using what carried out the dry hard of this at 80 degrees C for 1 hour.

[0075]

[Table 9]

**** Part . Rate **** alpha-3 4 weight sections C-2 39 weight sections SUMIJURU N-3500 7 weight sections TIPAQUE CR 97 19 weight sections Butyl-acetate 31 weight section [0076] By the same method as example of comparison 1 example 1, it mixed uniformly and the component of prescription shown in the following table 10 was paint-ized, it painted so that the thickness after dryness might become 20 micrometers on an above-mentioned base-material front face, and physical-properties evaluation of ultraviolet-rays resistance etc. was performed after the dryness between seven days of ordinary temperature.

[0077]

[Table 10]

**** Part . Rate **** alpha-4 3 weight sections C-1 41 weight sections SUMIJURU N-3500 7 weight sections TIPAQUE CR 97 19 weight sections Butyl-acetate 30 weight section [0078] By the same method as example of comparison 2 example 1, the component of prescription shown in the following table 11 was paint[mixed]-ized uniformly, it painted so that the thickness after dryness might become 5 micrometers on an above-mentioned base-material front face, and physical-properties evaluation of ultraviolet-rays resistance etc. was performed after 30-minute printing at 180 degrees C.

[0079]

[Table 11]

**** Part . Rate **** alpha-5 5 weight sections C-1 39 weight sections Curing agent phenol novolak resin 7 weight sections TIPAQUE CR 97 19 weight sections Butyl acetate 30 weight sections [0080] By the method of boiling like example of comparison 3 example 1, the component of prescription shown in the following table 12 was paint[mixed]-ized uniformly, it painted so that the thickness after dryness might become 20 micrometers on an above-mentioned base-material front face, and physical-properties evaluation of ultraviolet-rays resistance etc. was performed after the dryness between seven days of ordinary temperature.

[0081]

[Table 12]

**** A part Rate **** C-1 42 weight sections SUMIJURU N-3500 5 weight sections Butyl acetate 53 weight sections Set for the above examples 1-8 and the examples 1-3 of comparison. The main combination component of the used paint compound is shown in Table 13, and the measurement result of paint film physical properties is shown in Table 14.

[0082]

[Table 13]

表13：塗料主要成分配合

	成分A (官能基mol%)	成分B 架橋剤	成分C アクリル 共重合体	成分D 顔料
実施例1 A+B+C+D	A-1 (水酸基100%)	ポリイソシアネート	C-1 (水酸基)	D
実施例2 A+B+C+D	A-2 (エポキシ基100%)	フェノールボラック	C-1 (水酸基)	D
実施例3 A+B+C+D	A-3 (水酸基80%)	ポリイソシアネート	C-1 (水酸基)	D
実施例4 A+B+C+D	A-1 (水酸基100%)	アミン樹脂	C-1 (水酸基)	D
実施例5 A+B+C+D	A-1 (水酸基100%)	ポリイソシアネート	A801 (水酸基)	D
実施例6 A+B+C	A-1 (水酸基100%)	ポリイソシアネート	C-1 (水酸基)	-
実施例7 A+B+D	A-1 (水酸基100%)	ポリイソシアネート	-	D
実施例8 A+B+C	A-3 (水酸基80%)	ポリイソシアネート	C-2 (水酸基)	D
比較例1 A'+B+C+D	A-4 (水酸基30%)	ポリイソシアネート	C-1 (水酸基)	D
比較例2 A'+B+C+D	A-5 (エポキシ基30%)	フェノールボラック	C-1 (エポキシ基)	D
比較例3 B+C+D	無し	ポリイソシアネート	C-1 (水酸基)	D

[0083]

[Table 14]

表14：塗膜の物性の測定結果

	紫外線蛍光灯式耐候性 1000hrs後		初期光沢値	乾燥条件
	塗膜外観	光沢保持率		
実施例1	○	96	87	常温7日間
実施例2	○	92	86	180℃, 30分焼付
実施例3	○	93	85	常温7日間
実施例4	○	93	86	180℃, 30分焼付
実施例5	○	90	92	常温7日間
実施例6	○	97	88	常温7日間
実施例7	○	94	75	常温7日間
実施例8	○	98	91	80℃, 60分
比較例1	△	60	86	常温7日間
比較例2	×	55	84	180℃, 30分焼付
比較例3	○	30	90	常温7日間

[0084]

[Effect of the Invention] According to the paint compound containing the functional-group content ORGANO PORISHIRU sesquioxane of this invention, it becomes possible to obtain the paint film excellent in endurance, weatherability, especially ultraviolet-rays resistance. Therefore, the paint compound of this invention is widely applicable to the paint of outdoor-type way fields, such as engineering works and construction, especially.

[Translation done.]